MAJOR DIVISION			GROUP SYMBOL	LETTER SYMBOL	GROUP NAME
COARSE GRAINED SOILS CONTAINS MORE THAN 50% FINES	**GRAVEL AND GRAVELLY SOILS** MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH 5% FINES		GW	Well-graded GRAVEL
				GP	Poorly graded GRAVEL
		GRAVEL WITH BETWEEN 5% AND 15% FINES		GW-GM	Well-graded GRAVEL with silt
				GW-GC	Well-graded GRAVEL with clay
				GP-GM	Poorly graded GRAVEL with silt
				GP-GC	Poorly graded GRAVEL with clay
		GRAVEL WITH ≥ 15% FINES		GM	Silty GRAVEL
				GC	Clayey GRAVEL
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH 5% FINES		SW	Well-graded SAND
				SP	Poorly graded SAND
		SAND WITH BETWEEN 5% AND 15% FINES		SW-SM	Well-graded SAND with silt
				SW-SC	Well-graded SAND with clay
				SP-SM	Poorly graded SAND with silt
				SP-SC	Poorly graded SAND with clay
		SAND WITH ≥ 15% FINES		SM	Silty SAND
				SC	Clayey SAND
FINE GRAINED SOILS CONTAINS MORE THAN 50% FINES	SILT AND CLAY	LIQUID LIMIT LESS THAN 50		ML	Inorganic SILT with low plasticity
				CL	Lean inorganic CLAY with low plasticity
				OL	Organic SILT with low plasticity
		LIQUID LIMIT GREATER THAN 50		MH	Elastic inorganic SILT with moderate to high plasticity
				CH	Fat inorganic CLAY with moderate to high plasticity
				OH	Organic SILT or CLAY with moderate to high plasticity
HIGHLY ORGANIC SOILS				PT	PEAT soils with high organic contents

Notes

1. Sample descriptions are based on visual field and laboratory observations using classification methods of ASTM D2488. Where laboratory data are available, classifications are in accordance with ASTM D2487.
2. Same percentage distribution and group name method applies to fine-grained soils and % of sand and gravel it contains.
3. Fines are material passing the U.S. Std. #200 Sieve.

AECOM Geosyntec consultants

PDI Portland Harbor Superfund Site Pre-Remedial Design and Baseline Sampling Portland, OR

Appendix A-1: Summary of the ASTM Visual-Soil Classification Method

Appendix A-1 Portland Harbor PDI
Sediment Sample Logging Key

Visual Sediment Descriptions consist of the following:

- Moisture content
- Density/consistency (estimated based on visual observation)
- Color (Munsell Number)
- Major/Minor Contituents
- Amount and shape of minor constituents and major constituent structure
- Sheen and odor
- Redox potential discontinuity

Example: wet, soft, olive green (GLEY 1, 5/10Y) clayey SILT, little sand, moderate shell fragments, and trace twigs and rootlets. Silt texture is uniform, slightly compressible, massive, blocky, and of low plasticity. Slight odor and trace sheen. RPD 1 cm.

Sediment Description Terminology: Estimated based on visual observations

Moisture Content

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content, no visible water
Wet	Visible free water, probably above optimum

Color descriptions in Munsell Charts

Density: Visual Core Drive Penetration

SAND or GRAVEL		SILT or CLAY
Density	**Visual**	**Consistency**
Very loose	freefall	Very soft
Loose	easy penentration	Soft
Medium dense	moderate penentration	Medium stiff
Dense	hard penentration	Stiff
Very dense	refusal	Very Stiff/Hard

MAJOR and Minor Constituent % (by weight)

Core Logs	Percent	Field Logs
Trace (clay, silt, etc.)	0–5	not identified
Few (clay, silt, etc.)	5-15	Slightly (clayey, silty, etc.)
Little (clay, silt, etc.)	15-30	Clayey, silty, sandy, gravelly
Clayey, silty, sandy, gravelly	30-50	Very (clayey, silty, sandy, etc.)
GROUP NAME	> 50	GROUP NAME

Other Minor Constituents: % (by volume)

(i.e., shells, wood, organics, plastic, non-native debris)

Trace	0-5
Scattered	5-10
Moderate	10-30
Substantial	30-50
GROUP NAME	> 50

Structure

Stratified	Alternating layers of varied material/color at least 1/4" thick
Laminated	Alternating layers of varied material/color at least 1/4 mm thick
Blocky	Cohesive soil that can be broken down into smaller lumps
Spongy	Organic and compressible nature
Lensed	Inclusion of thin discontinuous layers of different sediment
Homogenous/Massive	Same color and appearance throughout
Fibrous	Stringy or rope like structure
Seam	1/16 to 1/2" thick
Layer	greater than 1/2" thick
Interbedded	Multiple beds within a unit
Rolls Easily	Play-dough like (plasticity observation)
Angular	Sharp edges
Subangular	Rounded edges
Subrounded	Well-rounded edges
Rounded	Smoothed, no edges

Odor Descriptions

none
trace
slight
moderate
strong

Sheen Test- % coverage

S.T. = Sheen test visual analysis	
none, trace	<2
slight sheen	2-15
moderate sheen	15-40
moderate to heavy	40-70
heavy	>70

Sheen Test- Visual Description

rainbow	multicolored
metallic	metallic gray-colored
florets	semi-circular and multicolored
streaks	long and flowing shape

Other Sediment Descriptions Used

Agglomerate	Fused-appearance, often vesicular
Clast/inclusion	Non-fused appearance
Xenoclasts	Clasts that have been moved
Fresh	No visible sign of decomposition or discoloration
Winnowed	Loss of fines
Slumped	Settled but intact
Pockets/balls	Semicircular to circular inclusion/deposit
Chunky	Mass of unidentified material

Sediment Core Log Guidelines

----------	color or minor change
_____	major sediment change
▬▬▬▬	depositional change

Core Acceptance Guidelines

1. Desired drive/penetration depth is reached.
2. Core recovery is greater than 70%.
3. Core tube appears intact (no signs of blocking, bending).
4. Minimal sediment loss out the top or bottom (minimal winnowing).

Grab Acceptance Guidelines

1. No or minimal excess water leaking from the jaws of the sampler.
2. No excessive turbidity in the overlaying water of the sampler.
3. Sampler did not over-penetrate.
4. Sediment surface appears to be intact with minimal disturbance.
5. Program-specific penetration (30 centimeters) has been achieved.

NOTES:

*Classification of sediment on core logs is based on visual field observations.
Classification notes should not be construed to imply laboratory testing unless presented herein. Unified Soil Classification System ASTM D-2487 and Visual-manual classification method ASTM D-2488 for the description and identification of soils were used as an identification guide.

Appendix A-2 Portland Harbor PDI
Sediment Sampling Equipment List

Safety Equipment
GPS
Cell phones (fully charged) or Satellite phone (if no cell coverage)
VHF radios
Rescue rope in throw bag
Air horns and/or whistles
Waterproof flashlight
Secondary "kicker" motor or alternative propulsion
Bailer or bilge pump/emergency pump
Length of rope for securing boat
US Coast Guard approved Type III or V PFD or life jacket
Type 4 throwable ring or cushion
Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers.
Anchor with appropriate length of line
First-Aid Kit and AED
Oil booms
PID
Bottled water
Snacks
Float plan

PPE
Boots, waterproof, steel-toed
Gloves, nitrile, heavy outer
Gloves, nitrile, thin inner
Hard hats
Hearing protection
Rain slicks
Safety glasses/goggles
Butcher apron or Tyvek for decon
Warm/dry clothes

Sample Handling
Vibracore sampler, core and tubes [1]
Hydraulic power grab sampler [2]
Bowls, large, stainless
Spoons, small, stainless
Spoons, large, stainless
Bottleware, sample analyses specific
Sample labels
core caps [1]
core catchers [1]

Plans
Field Sampling Plan [3]
Maps
Health and Safety Plan
Quality Assurance Program Plan

Tools
Hacksaw and Circular saw [1]
Extension cord and power strip [1]
Drywall blade, 6"
Ruler (12 inch/30 cm)
Measuring tape (with 1/10 inch increments) [1]
Rubber mallet [1]
Screwdrivers (Phillips, flat)
Siphon tubes [2]
Utility knife
Lead line (if not on vessel)

Supplies
Handheld GPS, fully charged
Camera
Gas for boat, if applicable
Keys for boat, if applicable
White board, white board markers
Bags, plastic zip, gallon-size
Bags, plastic zip, quart-size
Duct tape, electrical tape, and packing tape
Plastic sheeting
Ice
Logs, field [3]
Field books
Paper towels
Pens, ballpoint, permanent [3]
Sharpies, small and large
Trash bags
Zip ties
4" pipe clamps
Core carrying box

Decon Equipment
Brushes, long-handled
Brushes, short-handled
Detergent, laboratory (e.g., Alconox)
Methanol/hexane in dispensing bottle (optional)
Nitric acid, 10% in dispensing bottle (optional)
5 gallon buckets, or similar
Aluminum foil
Water, distilled in dispensing bottle

Notes:
1: Subsurface Coring specific equipment
2: Surface grab sampling specific
3: Write-in-Rain waterproof paper/pens are recommended

Appendix A-3: Portland Harbor PDI Surface Sediment Sampling Log

Sample Location:_____
Sample Date:___/____/____

GPS Location Code:	
Weather Conditions:	
Tide (CRD)**:**	
Water Depth (ft)**:**	

Sampling Personnel:

Sample Area (circle one)**:**	Baseline/BL	SMA/In-water Core	Downtown/Upriver
Analytical Suite (circle one)**:**	Full ROD Table 17	Four Focused COCs	

Sample Location						
		Coordinates		Accepted (Y/N);	Recovery	
Attempt #	**Time**	**Northing**	**Easting**	**Photo** (Y/N)	**Depth** (cm)	**Comments:** (i.e., winnowing, jaws close, biota, overfill, good seal, sample depth)

Sediment Description
Moisture: **Density:** **Color:**
Minor/Major Constituent %:
Structure:
Odor/Sheen:
Redox Potential Discontinuity (RPD): **cm**
Other:

Primary Sample Information		
Sample ID	**Time**	**Containers**

QA/QC Sample Information				
Sample ID	**Time**	**QA/QC Type**	**Containers**	**Primary Sample**

EPA Oversight During Sample Collection? No Yes

Additional Comments